S·A·E JOURNAL

Published Monthly By The Society of Automotive Engineers, Inc.

W. J. Davidson, President — David Beecroft, Treasurer

John A. C. Warner, Secretary and General Manager

Norman G. Shidle, Executive Editor

Vol. 45 — OCTOBER, 1939 — No. 4

CONTENTS

About Authors

● **Edmund T. Allen** *had just completed his freshman year at University of Illinois when 1917 rolled around and he quit college to enlist. Trained to be a pilot, then an instructor, he next was sent to England to learn how the British did their testing – and that mission led him into the test pilot field. Before the Armistice he returned to McCook Field, Ohio, and later resigned from the Army to become the first test pilot of the NACA at Langley Field. He re-entered the U. of Illinois in 1919 and after one year there spent two at MIT studying aeronautical engineering. He cracked his nose while piloting a glider in a German meet, has flown the air mail, and in his 6700 hr of flying has tested some 30 different types of airplanes for leading companies, ranging from the smallest pursuit planes to the giant Boeing B-15 super bomber, and the Boeing 314 Clippers, the largest land plane and flying boats in the world today. Consulting aeronautical engineer at the time "The Testing of Large Aircraft" was written, he since has joined Boeing as chief of flight and research.*

● *Few men have knowledge of what happens to fuels in automobile engines equal to that of* **T. A. Boyd** *(M '27) who has headed the fuel department of General Motors Research Laboratories Division since 1923. His researches have been concerned chiefly with the bugbear of knock – just what knock is, how tendency to knock varies from fuel to fuel, and how to eliminate it. With C. F. Kettering and Thomas Midgley, Jr., he is co-discoverer of the antiknock effects of the liquid compounds of lead. He is author and co-author of some 40 technical papers, numerous semi-technical or popular articles, and has written several books. Mr. Boyd is an alumnus of Ohio State University, receiving his Bachelor of Chemical Engineering degree in 1918 and the degree of Chemical Engineer in 1938.*

● **Donald B. Brooks** *tell us that he first developed a liking for things automo-*

(Continued on page 23)

Publication Office, 56th and Chestnut Sts., Philadelphia, Pa.; Editorial and Advertising Departments at the headquarters of the Society, 29 West 39th St., New York, N. Y. Western Advertising Office, Room 2-136 General Motors Bldg., Detroit, Mich.

Got a Control Problem?

Remote or direct···straight-line or devious···through dash or frame members or out in the clear···give thought to hydraulics, and—

Call Bendix!

Much of your best passenger-car engineering work must be smartly hidden these days—no more out-in-the-open levers, linkages, rods, cranks and other mechanisms such as our older cars once showed so proudly. And more and more, these controls, instead of being located as they used to be, at the handiest construction point, must be moved and changed in form for utmost driving convenience. In truck and bus engineering, the cab-over-engine and rear-engine designs entail a whole train of control problems that are demanding better solution.

So, to automotive engineers whose imaginations are fertile and active, all this would seem to point inevitably to *hydraulic actuation* for scores of control functions heretofore served by mechanical linkage . . . because:

HYDRAULIC ACTUATION may be led to the precise point needed, without complicated geometry.

HYDRAULIC ACTUATION may be led through dash or through frame members, without concern for any of the factors which limit the location of mechanical linkage.

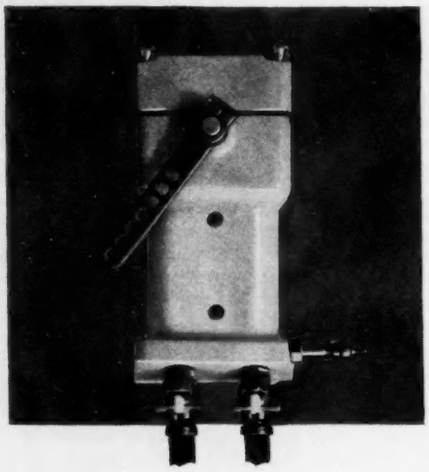
HYDRAULIC ACTUATION, being utterly silent, entails no precautions such as providing springs, rubber, or other devices for take-up of play.

HYDRAULIC ACTUATION, obviously, requires no lubrication. Its service needs are infrequent, simple and universally understood.

HYDRAULIC ACTUATION, employing incompressible liquid, is positive, involves no play, cannot wear loose.

HYDRAULIC ACTUATION, already universally favorite in the marine control field (where each installation is of virtually custom design), is in no sense experimental—there are years of thorough satisfaction back of it.

Bendix research and the already large number of fully developed Bendix Hydraulic Control units, can vastly simplify your control layout problems . . . *and save you time and money.* May we prove this to you? *Call Bendix!*



FLEXIBILITY IS ASSURED BY BENDIX HYDRAULIC ACTUATION

A captive hydraulic circuit, connecting control levers to an actuating unit of the type illustrated (many other types available), provides instantly responsive, noiseless, low-friction remote control. This is essentially identical in principle to the modern hydraulic brake faithfully performing on so many millions of motor vehicles. Bendix Hydraulic Actuation offers infinite possibilities in control layout.

Bendix

BENDIX PRODUCTS DIVISION
of BENDIX AVIATION CORPORATION, 401 Bendix Drive, South Bend, Ind.

Hydraulic Control Units

Fundamental Characteristics of Moldable Plastics

By Gordon Brown
Bakelite Corp.

Fig. 1 – Device used to demonstrate impact resistance of various plastics by subjecting each molded plastic cup to hammer blows of increasing power until the cup breaks or continues to resist breakage

WITH the number of moldable plastics increasing so rapidly each year, the engineer is likely to become confused in determining which type of material to specify for a given application. It is the purpose of this paper to clarify the relative properties of the most important present-day moldable plastics so that the selection of the proper material may be determined more easily. We will bring out that, if one single property is desired above all others in a molded piece, there is usually some compromise or sacrifice in other properties that must be made when selecting the right material.

Moldable plastics are divided into two types – thermosetting, including the phenolics and ureas; and thermoplastic materials, including cellulose acetate, methyl methacrylate, and polystyrene. There are several others, but they are not yet of sufficient commercial importance to warrant inclusion in the present discussion.

Thermosetting materials have the characteristic of first softening under heat and then reacting chemically to become permanently hard and infusible. The thermosetting materials, at present the most widely used, are characterized by their hardness, rigidity, dielectric strength, resistance to solvents, and relatively high chemical resistance. They are low in flexibility and in impact strength, or toughness, except for the special impact-resistant phenolic materials.

Thermoplastic materials have the characteristic of softening under the action of heat and receive their finished form by cooling. Such materials can be re-softened repeatedly upon application of heat. The thermoplastics are characterized by a relatively high degree of flexibility, toughness or impact strength, solubility in various solvents, color retention, and the ability to be made into practically any color from water white to jet black.

There are certain difficulties in generalizing the properties of the thermosetting and thermoplastic groups. For instance, as a class, thermoplastic materials having a light-colored base can be colored readily in tints and translucent shades; but it should not be assumed that the thermosetting materials lack this particular characteristic. The urea materials, although thermosetting, are made from a colorless base and also can be tinted in all shades of the rainbow. The urea base also has a high degree of color retention. Although the majority of thermosetting materials are regarded as having relatively low impact value, the high impact-resistant phenolic molding materials are extremely tough and resistant to shock. Molded pieces made from this material, even when cracked, have a tendency to hold together because of the fabric filler. There are many other exceptions to the general classifications just mentioned, and they should be considered carefully when selecting the most suitable plastic for a given purpose. Now let us consider the thermosetting materials and then the thermoplastics.

Thermosetting Plastics

Phenolics – The most widely used thermosetting materials are the phenolics. They are made from a wide variety of phenolic resins and these resins, in turn, are combined with many different fillers to secure one property or another in special high degree. They generally are characterized by hardness, rigidity, high tensile strength, heat resistance, and solvent resistance. Since the basic resin is always amber-colored and tends to discolor under the action of sunlight, the color possi-

[This paper was presented at the Washington Section Meeting of the Society, Washington, D. C., April 11, 1939.]

bilities and color-retention values of the phenolics are relatively poor, although very substantial quantities of colored phenolic materials are used for a wide variety of purposes.

There are too many special types of phenolic materials to attempt to discuss them all in this paper; hence I have selected five which are representative of the range of differences procurable from the phenolic materials as a class. They are: general-purpose woodflour-filled material, special telephone handset material, high-impact material, acid and alkali-resistant material, and transparent material. Since a discussion of all the characteristics of even this small representative group would require an abnormal amount of space we simply will describe demonstrations, made by the author during presentation of this paper, of only two of the characteristics, and discuss some of the others on the basis of graphs (Figs. 2-9). We selected for demonstration the relative impact resistance and resistance to boiling water over a short period of time simply because these two properties could be demonstrated readily.

Ordinarily, impact resistance is measured on a bar ½-in. square in an Izod impact tester, but I felt that, for demonstration purposes such as this, a molded cup, for various reasons, makes a better test piece. We therefore employed the device illustrated in Fig. 1 which gives a purely empirical test. The device used was made simply so that we could produce a uniform blow of the hammer on the cup.

Impact Resistance Demonstrated

To demonstrate impact resistance the author subjected each cup to hammer blows of increasing power until the cup was broken, or until it was demonstrated that the cup would continue to resist breaking on the device. As they were broken, each cup was thrown into a beaker of boiling water. This demonstration was continued for cups made of the following materials: urea, cellulose acetate, methyl methacrylate, polystyrene. The following conclusions were noted with respect to the phenolic materials:

It was shown that the general-purpose phenolic material has good strength against a blow and would resist a lot of abuse in a wide variety of uses. It is also little affected by boiling water, the only change noted being a slight dulling of the surface. The material will, however, absorb small quantities of water under such conditions. This general-purpose material, made with a combination of resin and woodflour filler, has a most desirable combination of properties, being readily moldable either by itself or around inserts, having high tensile and flexural strength, good electrical insulation, heat resistance, water and solvent resistance, hardness, rigidity and good dimensional stability after molding. It has high compressive strength, and practically no cold flow. It is because of this combination of desirable properties that it is used for such divergent applications as automotive ignition parts, household wiring devices, bottle caps, merchandise packages, radio cabinets, buttons, typewriter space bars, and innumerable other uses that the public has watched develop over the past 25 years.

The general-purpose material, however, is not sufficiently strong to suit the requirements of a telephone handset. Accordingly, it is noted that this material also showed very good resistance to boiling water, and has the same uniform black, glossy appearance as has the general-purpose material, but it has a definite increase in impact strength. The disadvantage accompanying this improvement is explained as a slight loss in moldability, and higher cost.

The high-impact material cannot be broken on the testing device, although the bottom of the cup cracks. This material, however, shows a definite disadvantage in the matter of boiling-water resistance.

Although the transparent phenolic materials break most readily under the hammer blow, they are unchanged by the boiling water.

The acid and alkali-resistant material showed the same characteristics as the transparent phenolic in the demonstration; colorability and transparency were sacrificed to secure chemical resistance.

Urea – Although the urea molding materials constitute an important division of commercially used thermosetting materials, they are not made in the wide variety of combinations and on different basic resins similar to the phenolics. They are essentially one material, having hardness, rigidity, high tensile strength, and most outstanding color and color retention. Urea material is employed in a wide variety of applications, but almost always where color is a prime requirement. On the impact tester the cup withstands more blows than the general-purpose phenolic, but can be broken on the device. When it comes out of the boiling water it has a good appearance, and has lost none of its gloss, but it must be explained that this appearance is misleading, as the material is not recommended for service where it is subjected to high humidity or wet conditions, and particularly where it is moistened and dried alternately. Under such service the transparent phenolic is more suitable, but that material, in turn, always has the limitation of an amber base as against a colorless base for the urea.

Thermoplastics

Cellulose-Acetate – We have noted the desirability in many plastic uses of rigidity and hardness. For many other applications these properties become a disadvantage and, thereupon, the phenolics and ureas become less desirable than cellulose-acetate, by far the most widely used thermoplastic today. Flexibility combined with toughness in cellulose acetate makes it the ideal material for steering wheel and thin escutcheons where the decorative advantages of the material are desirable; yet where it must withstand great abuse. The automotive industry has been the principal user of acetate materials, not only for steering wheels, but also for all sorts of knobs, handles, panels, bevels, and other trim. Its decorative possibilities have resulted in its use, in many cases, as a replacement for the phenolic materials. Although the material is higher in price than the phenolics or ureas, the ability of the thermoplastic to be molded at a rapid rate in injection molding machines often compensates largely for the difference in the cost of raw material and gives cellulose acetate an important place in the field of plastics. On the impact tester the cup is completely unaffected but, in boiling water, it collapses readily and changes color, showing water absorption.

Consideration of the most suitable material for a given application always discloses innumerable exceptions to every property or apparent advantage of one material as against another. Thus, even in the matter of the test piece in the present case, no one shape can show off to best advantage the impact resistance and water resistance of every material. A cup-shaped piece of cellulose acetate is extremely difficult to produce in the compression mold used for making the cups.

Methyl Methacrylate – This material has been seen on the market more in the form of windshields and windows for airplanes than in molded parts, but the use of the molding material is growing rapidly. It has the outstanding characteristic of a colorless base of great clarity, having greater transparency than glass. It is a very good insulator, and has low water absorption. To date the uses of this material have been primarily to secure its high degree of transparency. It is found in goggle lenses, prismatic reflectors, and some of the decorative parts of the automobile.

On the impact tester the first blow of the hammer produces

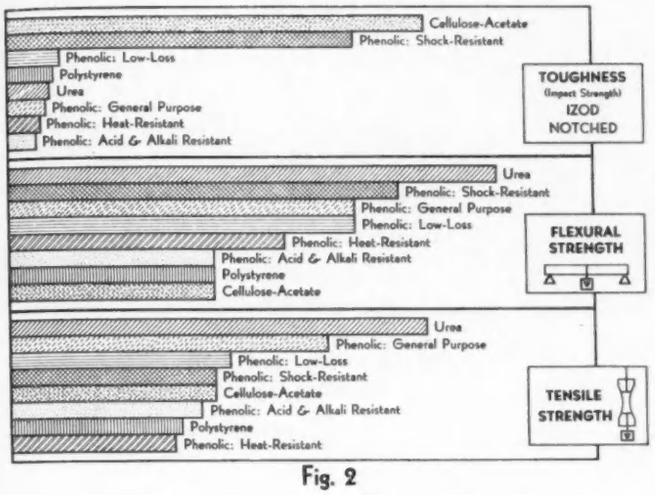


Fig. 2

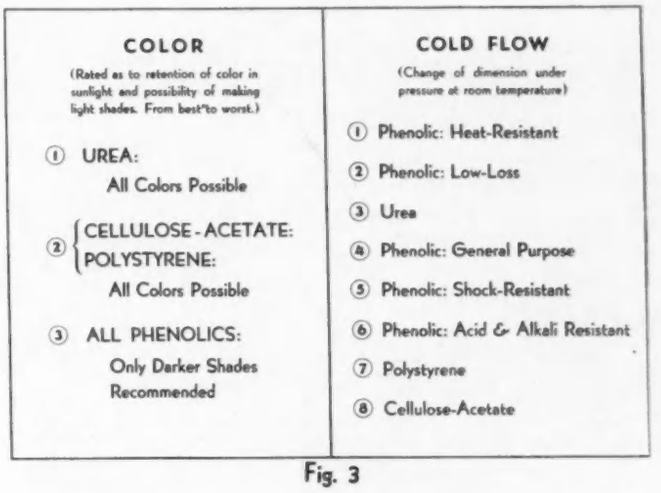


Fig. 3

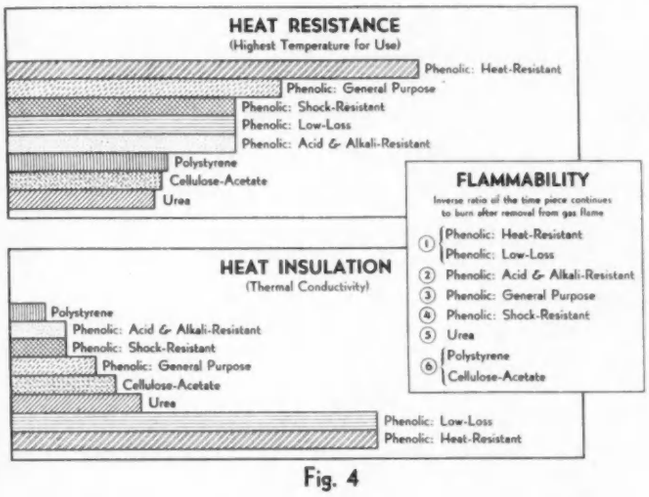


Fig. 4

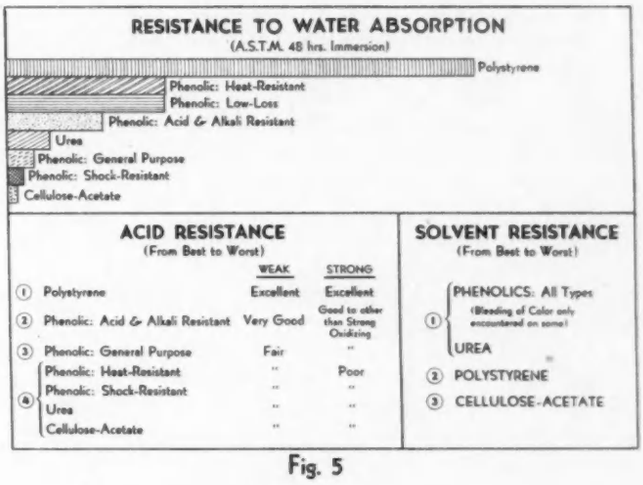


Fig. 5

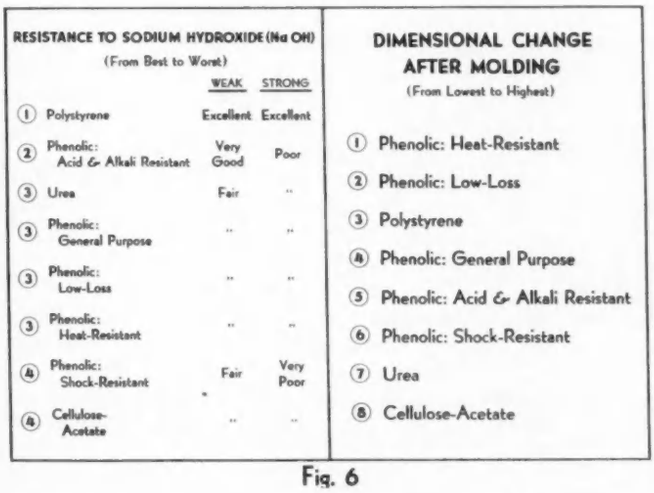


Fig. 6

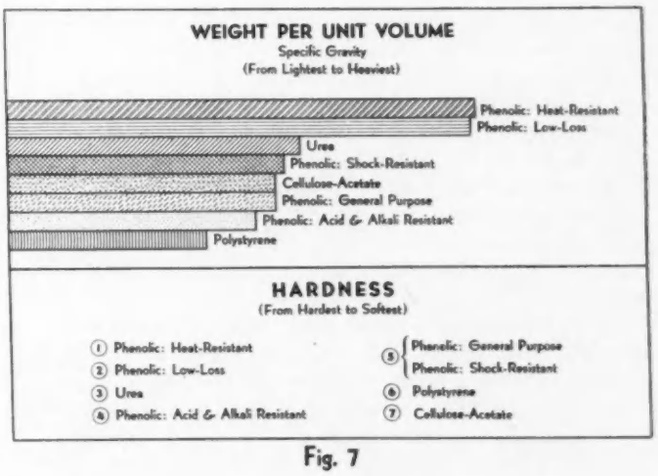


Fig. 7

Fig. 2 – Three measurements of mechanical strength must be considered to determine the suitability of a plastic. It will be noted that cellulose-acetate, highest in impact strength, is lowest in flexural strength

Fig. 3 – General relationship among moldable plastics of color possibilities and of likelihood of cold flow. Color is rated as to retention of color in sunlight and possibility of making light shades. Cold flow is indicated by change of dimension under pressure at room temperature

Fig. 4 – Being organic in nature, all plastics have decided limitations as heat insulators and in resisting heat compared with ceramics, glass, and metal. There is, however, a wide difference among plastics themselves in these properties as shown

Fig. 5 – The chart gives a general indication of the relative resistance of plastics to three of the many adverse conditions that are met in service

Fig. 6 – Compared with wood, vulcanized fiber, or paperboard, all plastics have a high degree of dimensional stability. When necessary to maintain close tolerances, the wide variation in dimensional stability shown among plastics must be considered carefully

Fig. 7 – Through low specific gravity, plastics that often are higher in price per pound yield finished products lower in price per unit. Hardnesses range from horn-like material to stone-like material

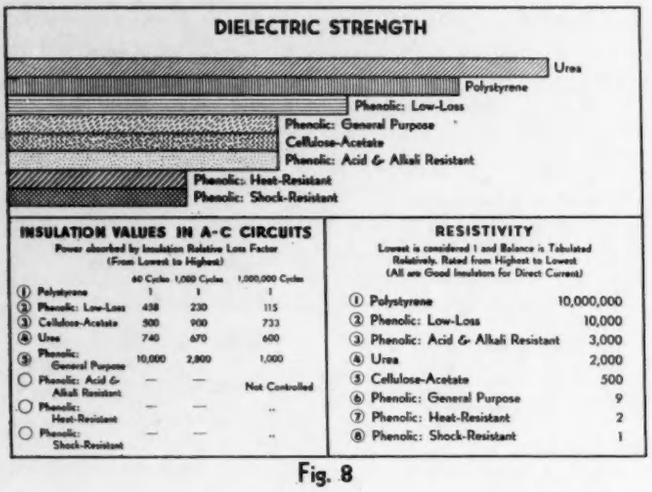


Fig. 8

Fig. 8 – The value of a plastic as an electrical insulator must be determined by more than one measure. Particularly in alternating or oscillating currents must loss factor be considered

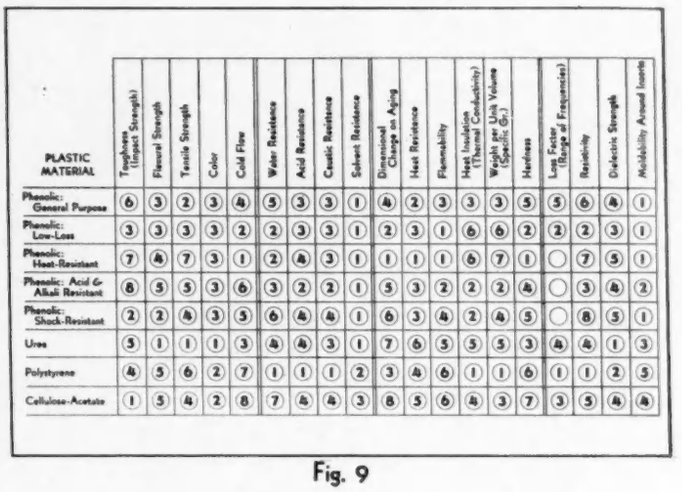


Fig. 9

Fig. 9 – This "applicability" chart can be used in preliminary determinations of suitability. Later all exceptions should be reviewed carefully, taking into consideration the price factor

internal cracks, but no blemish on the surface. The material is shown to be tough, and resists numerous blows before the bottom of the cup finally breaks through. The cup does not shatter as does the transparent phenolic cup.

In the boiling water, the material has a tendency to go back to its original granular form. This action produces a hazy appearance, and a tendency to shrivel. There is little if any water absorption during the period of test.

Polystyrene – Like the methyl methacrylate, this material has a colorless base of great transparency, but is slightly harder and has the best water resistance and best electrical-insulating characteristics of any of the plastics. It also has excellent resistance to strong inorganic acids, such as sulphuric and nitric. Although it is readily soluble in coal-tar solvents such as toluol, it is completely insoluble in alcohol which, for some applications, gives the material an advantage as against cellulose acetate which is readily affected by alcohol.

At the present time polystyrene is being produced in the injection-molding process in the form of bottle caps, combs, liquor pourers, radio coil forms, and fitments for the inside of refrigerators, to mention only a few of the many uses already developed for this extraordinary material.

Polystyrene can be distinguished from methyl methacrylate by its almost metallic-like clink when molded parts come in contact with each other. On the impact tester it shows similar results to methyl methacrylate, and again the bottom of the cup gradually breaks through, rather than to shatter. It should be noted that, had the cup used in the demonstration been produced by the injection-molded process instead of by the compression method, the strength would have been considerably increased.

In boiling water there is also the same tendency as with methyl methacrylate to shrivel and go back to the granular form. There is no water absorption.

The two tests – impact and boiling water – to which the foregoing materials were subjected alone will impress the observer with the necessity of balancing one desirable property against another but, when two or three attributes, including price, vie closely with each other as determining factors, it becomes necessary "to call in the doctor." In spite of the fact that much data have been collected on modern plastic materials, it still requires a broad background of experience in successful applications to assist in the determination of what particular plastic will best suit each individual requirement of practical use.

A Low-Density Aircraft Material

SOME of us became convinced a few years back that, even assuming that high-strength aluminum products could be made available in sufficient quantities and at reasonable cost, any type of structure which demanded such a multiplicity of reinforcing parts and so many thousands of rivets did not constitute the best final answer for rapid and inexpensive production. Regardless of cost, and even assuming an unlimited number of skilled workmen, it seemed to be a physical impossibility to find sufficient space around airplane assemblies for men to work to insure rapid production.

Now, all these stiffeners and all these rivets are necessary because the metal shell is so thin, for reasonable weight, that it cannot support stresses in compression without them. A *thicker* shell, perhaps one four or five times as thick, might be sufficiently stable against buckling, without reinforcing stringers to gain some of the real strength of the material.

A material, which we have named "Duramold," having specific gravity which may be accurately controlled within 3% ±, within a range from 0.5 to 0.9, has been developed. Within this range, the strength and elastic modulus vary, roughly, as the density. In its final form this material is sufficiently non-hygroscopic and free from attack by fungi or molds and other kinds of deterioration to answer all practical requirements of airplane service operation.

In resistance to fatigue – based on allowable stress – for equal weight per unit area, Duramold is about 50% better than 17ST Duralumin.

The material will not support combustion, and is not subject to corrosion.

The finished external surfaces are smooth, and calculations, based on wind-tunnel tests at fairly high Reynolds Number, indicate that, for a high-speed airplane having fuselage, wings and fixed tail units of Duramold, in the order of 25% less power will be required at that given high speed than for an all-metal airplane with projecting rivet heads, lap joints, and the inevitable waves and wrinkles.

Excerpts from the paper: "A Low-Density Material for Aircraft Structures," by V. E. Clark, Clark Aircraft Corp., presented at the World Automotive Engineering Congress of the Society, New York, N. Y., May 26, 1939.

Announcing

3 SAE MEETINGS

and the

SAE *Annual Dinner*

HOTEL PENNSYLVANIA
NEW YORK

October 16th

- **Dr. Karl Taylor Compton**

  President, Massachusetts Institute of Technology

"The Road Ahead in Research"

National TRANSPORTATION AND MAINTENANCE MEETING

ST. LOUIS, MO.
OCT. 26 & 27

Thursday, Oct. 26

Fleet Tires — F. K. Glynn, Chairman

New Life in Fleet Tires – L. W. Fox, sales engineer, Firestone Tire & Rubber Co., and A. L. MacCracken, Goodyear Tire & Rubber Co.

Maintenance — R. J. Collins, Chairman

How Changes in Models Affect Automotive Maintenance – Ellis W. Templin, automotive engineer, Los Angeles Department of Water & Power.

Transportation Dinner — G. R. Ericson, Chairman

H. O. Mathews, *Toastmaster*

Color Selection with Relation to Truck and Bus Body Designs – R. H. Brouck, E. I. du Pont de Nemours & Co.

Tickets $2.25 *No Reserved Places*

Friday, Oct. 27

Speed Gear-Changes — C. J. Bock, Chairman

Two-Speed Axles – J. R. Bartholomew, sales engineer, Eaton Mfg. Co.

Multi-Speed Transmissions – C. D. Peterson, executive engineer, Spicer Mfg. Corp.

Engine Wear — L. B. Gilbert, Chairman

Factors in Engine Operation Which Contribute to Wear – F. L. Faulkner, manager, automotive department, Armour & Co.

Factors in Bus Engine Wear – W. J. Cumming, general superintendent, Surface Transportation Corp.

Factors in Large Truck Engine Wear – G. W. Laubie, manager, automotive transportation, Atlantic Refining Co.

Public Utility Fleet Supervisors — Closed Session

Coronado Hotel

★ ★ ★ ★ ★ ★ ★

National AIRCRAFT P

Louis Johnson, Assistant Secretary of War, heads a list of 16 speakers on the three-day Aircraft Production Meeting Program. Technical papers will center on every phase of quantity production necessary to meet today's accelerated demands, both military and commercial.

New this year will be the Aircraft Engineering Display at which the latest engineering developments in parts and materials will be exhibited.

National FUELS & LUBRICANTS MEETING

TULSA, OKLA.
NOV. 2 & 3

Varied Program Planned

FUELS and lubricants men, and other automotive engineers as well, will come from hundreds of miles to attend this National Meeting which has become an annual event. A diversity of subjects has been scheduled to cover automotive topics vital to petroleum men and engineers, particularly in the great Southwest.

MEMBERS of the Committee on Arrangements, headed by B. E. Sibley, former SAE Fuels and Lubricants vice-president, have been in close contact with 1939 Vice-President A. G. Marshall and other officers of the Activity Committee, in developing the program. The SAE Group of Tulsa is cooperating.

PRODUCTION Meeting

★ **OCT. 5-7**

★ **BILTMORE HOTEL**

★ **LOS ANGELES**

Some of the Topics

Hypoid Gear Lubrication

Military Aircraft

Oil Industry Power

Power for Moving Earth

Motor Fuels

SAE Activities

•

Student Debate — Nov. 3

FRANK A. SUESS, *Chairman*

Resolved: That V-Type Engines Are to be Preferred to In-Line Engines for Passenger Car Equipment – KANSAS STATE COLLEGE vs. UNIVERSITY OF OKLAHOMA.

Hotel Mayo

★ ★ ★ ★ ★ ★ ★

SAE Nominees for 1940

Following are the names of those who have been nominated as officers and members of the Council for 1940:

President . . Arthur Nutt

Vice-President of Engineering, Wright Aeronautical Corp.

Treasurer . . . David Beecroft

Bendix Products Div., Bendix Aviation Corp.

Councilors

Term of 1940-1941

Murray Fahnestock

Editor, Ford Dealer & Service Field Magazine

James B. Fisher

Vice-President, Waukesha Motor Co.

Austin M. Wolf

Automotive Consultant

Members of the 1940 Council will include also the following three men who were elected at the beginning of 1939 for a two-year term:

W. E. McGraw

Chief Engineer, Chrysler Corp. of Canada, Ltd.

G. L. Neely

Research Engineer in charge of Fuels and Lubricants, Standard Oil Co. of Calif.

A. L. Beall

Research Engineer, Wright Aeronautical Corp.

Serving on the 1940 Council as Past-Presidents:

C. W. Spicer

Vice-President, Spicer Mfg. Corp.

W. J. Davidson

General Sales Manager, Diesel Engine Div., General Motors Sales Corp.

Vice-Presidents

Aircraft . . . . . S. J. Zand

Consulting Engineer, Sperry Gyroscope Co., Inc.

Aircraft-Engine . . . . . N. N. Tilley

Chief Engineer, Detroit Plant, Continental Motors Corp.

Diesel-Engine . . . . . C. G. A. Rosen

Assistant Chief Engineer in charge of Diesel Research, Caterpillar Tractor Co.

Fuels & Lubricants . . . . . Neil MacCoull

Research Engineer, The Texas Co.

Passenger-Car . . . . . James C. Zeder

Chief Engineer, Chrysler Corp.

Passenger-Car-Body . . . . . John Oswald

Olds Motor Works Div., General Motors Corp.

Production . . . . . Edwin R. Smith

Vice-President & General Manager, Seneca Falls Machine Co.

Tractor & Industrial Power Equipment . . . . . J. M. Davies

Research Engineer, Caterpillar Tractor Co.

Transportation & Maintenance . . . . . G. W. Laurie

Manager, Automotive Transportation, Atlantic Refining Co.

Truck, Bus & Railcar . . . B. Frank Jones

Chief Engineer, Truck Div., White Motor Co.

Your Society Meetings

By Philip H. Smith

LAST year professional men laid aside their work and traveled by automobile, bus, airplane, boat and subway to swell attendance at your Society's meetings to 25,000. 25,000 is heavy attendance in a world where the professional man's time is at a premium, but the meetings of your Society are much more than periodic gatherings of a clan. They are spots on the SAE plateau where all the activities, many of them subterranean even to an active member, accumulate sufficient force to bubble to the surface. Thus they provide oases for the thirsty engineer.

This analogy is not far-fetched. Meetings originate with the individuals who comprise the membership. They are endowed by this same membership with vitality to make them dynamic and productive. Successful meetings are never an accident. Each one is the reflection of intense personal interest and effort.

The word "meetings" fails to convey the real significance of gatherings generated by the Society. Perhaps no real idea can be had without attendance. They afford an opportunity for the direct transmission of facts, ideas and opinions through the agency of addresses and discussions; for close interchange through personal contact, and for the catalytic action of casual association. At predetermined intervals the special and detail work of individuals is elevated from the daily commonplace by a tying-in to a broader engineering conception. This gives an inspirational quality to the prosaic which is greatly enhanced through the casual sessions in corridor, lobby and sitting room.

It requires an extensive organization to handle meetings from their inception to fruition. Thus, each Section and Professional Activity has its meetings committee with the function of developing meetings. Then there is a National Meetings Committee which comprises among its members, the Chairmen of each of the Section and Activity Meetings Committees as well as five members-at-large who are appointed by the President.

It is out of this organization, which links the autonomous Activities and Sectional groups with the parent or national body, that the many types of meetings come which feature the work of the Society in all its scope. As the Society has grown and its autonomous units have multiplied it has been necessary to delegate more and more responsibility for the successful conduct of meetings, and, at the same time, to see that this responsibility is well placed. Every meeting must have financial and operating responsibility centered somewhere, and to establish beyond doubt where that center is to be, a recent definition of meetings has been promulgated. Accordingly, there are today, two classifications – "National" and "Section." Every gathering of the year falls under one or the other head as discussion will show.

National Meetings

National meetings are those generated and operated by the National Society or any one of the Professional Activity Committees. The best known are the Annual and Semi-Annual gatherings which are required to be held by the Constitution. Then there are those meetings generated by one or more of the Professional Activity Committees. A good example is the National Aircraft Production Meeting, the fourth of which will be held in Los Angeles this fall.

Under the classification "National" there is also a type of meeting which is not national in its attendance scope but is drawn from a particular area and generated by a Professional group. The Fuels and Lubricants Meetings in Tulsa and Dallas illustrates this type. When a meeting of this type is called, cooperation is likely sought from the Section or Sections within the meeting area.

"Section" meetings are defined simply as those generated and operated by a Section. All regular monthly Section Meet-

★ ★ ★

This is the tenth article of a series on "Your Society."

This series aims to bring alive every phase of Society functioning as related to the individual member.

★ ★ ★

ings come under this head. Then, too, on occasion a subject will arise of interest to a group of Sections which warrants the holding of a joint meeting. While held cooperatively, responsibility for group Section Meetings actually centers in a single Section. The Transportation and Maintenance Meeting held in Chicago last year examples this well. Here the Professional Activity Committee might be called upon for cooperation while responsibility for sponsorship and operation remained with the Section.

How Meetings Are Approved

Section Meetings do not regularly require approval by the parent body, but all other meetings do. If the national body is called upon for any assistance, approval must be had from the National Meetings Committee which, in turn, gets approval from the Council. The Council has the final say and it determines whether or not to make appropriations. The National Meetings Committee aids the Council in determination of meeting policies, oversees programs to prevent overlapping of topic and date, and it arranges programs of national gatherings to insure good topic balance.

National meetings originate either with the Activities Meetings Committees or the National Meetings Committee. The Activity group formulates the technical program, but the general program which links together all the activities is arranged by the National Committee. It is the responsibility, therefore, of the National Meetings Committee to coordinate and to harmonize special interests with the needs and interests of the Society as a whole.

Every detail dealing with the origination of a meeting is handled by a member. What the members want determines what they get. If a member deprecates the value of a meeting it is his privilege to set about working for improvement. He can express his view, originate a better idea, animate it, to the end that something of greater value will bubble to the surface. In a democratic organization, criticism is a genuine contribution when it is backed by constructive effort and suggestion.

The approval of the meetings program by the Council is the signal for the staff to step forward with assistance. There are two very sound reasons for the staff to take hold at this point. You can lead an engineer to an oasis but you cannot make him drink. The staff can help the oasis bubble clear, put palm trees around and provide route maps. Furthermore, the management of meetings is an onerous job; someone has to rent the palms, see to their proper shipment, plant and water them. There was a time in the history of the Society when members assumed responsibility for all meeting details, but no longer. The scope of operations is too large, the details too many and exacting to be handled as an aside.

It is doubtful if there are more than a handful of members who appreciate the mechanics of running off a meeting. In fact, a member can be extremely active in Society affairs without encountering more than a dozen details. But if the projector works without a hitch and the slides appear right side up the first time, it isn't an accident. If the banquet at the Annual Meeting comes to a neat close at 10 P.M. as scheduled, it didn't just happen. Nor does anything else move with the grease of dispatch without unremitting direction and supervision. The lack of confusion and clatter at a meeting is in indirect proportion to the planning and labor involved. Let's take a minute and look behind the scenes at the preparation.

The jelling of the program and the selection of papers are followed immediately by staff cooperation with the authors. Every speaker-author is given a time limit for submission of his paper. He receives a questionnaire asking him his needs as to equipment, while an accompanying mimeographed sheet tells him how to have slides made so that there will be no hitch. Prior to receiving a completed paper, an abstract must be obtained so that proper announcement of subject matter can be made, and members given plenty of time to peruse the program. Within an appointed time the papers will be in staff hands, copies prepared and distributed to the members picked for discussers, and there will be digests made for news and publicity purposes.

While this liaison with the speakers is taking place to generate interest in the program, there are other details to be handled. Contact must be made with the hotel, reservations made, and the layout studied so that the necessary equipment can be rolled in at the appointed hour. If the meeting hall is satisfactory and there are accommodations for the members attending, it is because someone foresaw needs.

To insure that for the want of a thumb-tack a meeting won't be lost, the staff uses a check list on which are noted all possible meeting needs, such as items for display, dinner, speaker, etc. There are some 75 odd items to be gone over and picked out, so that shipment can be made to the meeting place in plenty of season. At the last Annual Meeting, a half a ton of preprints went forth with many boxes and cases of supplies.

Every organization has perpetually before it the problem of making its usefulness readily accessible to members. In your Society maximum stress is placed upon meetings, much thought and effort are plowed into them, because it is realized that only by these frequent get-togethers is the entire Society pulse quickened. Twice a year, at Annual and Semi-Annual Meetings, and at a dozen odd times scattered throughout the twelve months, the best the membership has to offer is brought to the fore, coordinated, dramatized, and presented. These meetings are genuine oases, not mirages, created out of the bed rock of the membership for the benefit of the entire body.

New Members Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between Aug. 15, 1939, and Sept. 15, 1939.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Canadian Section

BERLYN, MARTIN (M) chief engineer, diesel engine department, Dominion Engineering Works, Ltd., P. O. Box 220, Montreal, Quebec.

Chicago Section

OVERHOLT, L. F. (M) International Harvester Co., Chicago (mail) 129 Southcote Rd., Riverside, Ill.

Cleveland Section

PETTERSON, CLARENCE O. (A) district sales manager, Fulton Sylphon Co., 1836 Euclid Ave., Cleveland.

Dayton Section

STOCKUM, ERNEST JOHN (A) G.H.R. Foundry Co., Dayton, O. (mail) P. O. Box 1021.

Detroit Section

ANDERSON, EDWIN W. (M) sales engineer, Wolverine Fabricating & Mfg. Co., Detroit (mail) 14155 Alma Ave.

BLOOMER, W. L. (A) manager, lubrication

department, Hickok Oil Co., 2313 Madison Ave., Toledo, O.

Metropolitan Section

APJOHN, THOMAS L. (J) chemical mechanical engineer, Socony-Vacuum Oil Co., Inc., 412 Greenpoint Ave., Brooklyn, N. Y.

SCHICK, EDWARD MARTIN (M) 1267 Pacific St., Brooklyn, N. Y.

New England Section

ELIOT, SAMUEL (A) partner, Amory Eliot Offices, 131 State St., Boston.

GARDNER, ROBERT (A) manager, automotive department, Lever Bros. Co., Cambridge, Mass.

HATCH, GEORGE FRANCIS (J) student, U. S. Diesel Engineering School, Boston (mail) 91 High St., Reading, Mass.

Northern California Section

LITTRELL, L. B. (A) instructor, Frank Wiggins Trade School, 1646 S. Olive, Los Angeles (mail) 1040 N. Harvard Rd., Burbank, Calif.

Northwest Section

COURTRIGHT, DON (J) figuring costs of new trucks, Kenworth Motor Truck Co., 1263 Mercer St., Seattle, Wash.

Philadelphia Section

BRANAMAN, GLENN D. (A) manager, Federal Mogul Corp., 1839 Wylie St., Philadelphia (mail) 1307 W. Wynnewood Rd., Wynnewood, Pa.

Southern California Section

BENJAMIN, JOE PENN (M) engineering draftsman, Glenn L. Martin Co., Baltimore, Md. (mail) c/o Douglas Aircraft Co., Engineering Department, Santa Monica, Calif.

GARD, EARLE W. (M) manager, research and development, Union Oil Co. of Calif., 1009 Union Oil Bldg., Los Angeles.

OSBORN, WILLIAM C. (M) industrial engineer, Chamber of Commerce Bldg., 1151 S. Broadway, Los Angeles.

WINTRINGHAM, JOHN S. (M) research engineer, Ethyl Gasoline Corp., Road Test Lab., 2600 Cajon Rd., P. O. Box 1199, San Bernardino, Calif.

Outside of Section Territory

JOHNSON, J. E. (A) vice-president, general manager, Muskegon Piston Ring Co., Muskegon, Mich.

OLSEN, OSCAR L. (M) service engineer, Electro-Motive Corp. (Sub. General Motors) 55th St. & Joliet Rd., La Grange, Ill. (mail) 6753 Indian Creek Dr., Miami Beach, Fla.

Foreign

AVON INDIA RUBBER CO., LTD. (Aff.) Melksham, Wilts., England. Representative: Mackay, John George, Dr., development manager and chief chemist.

BEAUVAIS, ROBERT (F M) assistant chief engineer, Societe des Moteurs Gnome & Rhone, 150, Blvd. Haussmann, Paris, France (mail) 37, Blvd. Victor, Paris 15, France.

BISCHOFF, GERALD THEOPHYLIUS (F M) works manager, Walford Transport, Ltd., 71-73 Park St., Calcutta, India.

BUCHI, ALFRED J. (F M) president, Buchi Syndicate, 20 Salstrasse, Winterthur, Switzerland.

NIXON, FRANK (F M) technical engineer, Bristol Aeroplane Co., Ltd., Filton, Bristol, England (mail) Hillcrest, Downs Cote Gardens, Westbury-on-Trym.

RIES, NICOLAS (F M) works manager, Accumulateurs Tudor Societe Anonyme, Usines de Florival, Brussels, Belgium (mail) 60 Chaussee de Charleroi.

ROUYER, GERARD P. J. (F M) secretaire general, Societe des Ingenieurs de L'Automobile, 3 Ave. de Friedland, Paris 8, France.

SIRTORI, ALESSANDRO (F M) chief engineer, Alfa Romeo via M. U. Traiano, Milano, Italy (mail) via Londonio 30, Milano, Italy.

Applications Received

Canadian Section

HOBLITZELL, FRED G., president and managing director, Anglo Petroleum Ltd., Toronto, Ont.

STUART, ARTHUR MATHESON, district sales and service representative of Ontario, National Automotive Parts Ltd., Toronto, Ont.

Cleveland Section

CROFT, HARRY P., chief metallurgist, Chase Brass & Copper Co., Inc., Cleveland.

LYNCH, FRANK W., sales engineer, Timken Roller Bearing Co., Canton, O.

Detroit Section

BAKER, G. D., sales manager, Bundy Tubing Co., Detroit.

BROWN, ARTHUR S., assistant engineer, Ethyl Gasoline Corp., Detroit.

HOBROCK, RAYMOND H., director of research, Bundy Tubing Co., Detroit.

Kansas City Section

DOUGHERTY, HOWARD FLEETWOOD, assistant shop foreman, Kansas City Power & Light Co., Kansas City, Mo.

Metropolitan Section

BUTUSOV, VICTOR P., representative in U.S.A., Peoples' Commissariat of Aircraft Industries of U. S. S. R. (Amtorg Trading Corp.) New York.

CLEMENTS, B., metallurgist, Wright Aeronautical Corp., Paterson, N. J.

LAWRENCE, PHILIP, mechanical engineer, Socony-Vacuum Oil Co., Inc., Paulsboro, N. J.

WASHBURN, EDWIN C., engineer, Sperry Products, Inc., Hoboken, N. J.

The applications for membership received between Aug. 15, 1939, and Sept. 15, 1939, are listed herewith. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Northern California Section

AINSWORTH, LAINE JOHNSTON, engineer, F. A. B. Mfg. Co., Oakland, Calif.

SULLIVAN, ARTHUR LAURENCE, Pan American Airways Co., San Francisco.

Pittsburgh Section

EBREY, GLENN O., research chemist, Mellon Institute, Pittsburgh.

SHINN, BYRON H., president and chief engineer, Shinn Devices Co., Butler, Pa.

St. Louis Section

BEARD, JAMES A., JR., engineer (automotive division) Wagner Electric Corp., St. Louis, Mo.

Southern California Section

GENERAL PETROLEUM CORP. OF CALIF., Los Angeles.

LANGLEY, H. J., U. S. Spring & Bumper Co., Los Angeles.

RECHT, HERMANN, carburetor service, United Motors, Inc., Los Angeles.

SMITH, DON P., president, Interstate Aircraft & Engineering Corp., El Segundo, Calif.

WEILL, M. F., field engineer, Ethyl Gasoline Corp., Los Angeles.

Washington Section

FENTRESS, WILLIAM KILBY, JR., engineering aide, Norfolk Navy Yard, Portsmouth, Va.

Outside of Section Territory

KUNZ, B. W., MAJOR, U. S. Army, Quartermaster Corps, Fort Bragg, N. C.

STONE, JOHN HELMS, equipment engineer, U. S. Forest Service, Atlanta, Ga.

CLARKE, JAMES ARTHUR, instructor, Provincial Institute of Technology and Art, Calgary, Alberta, Canada.

Foreign

CENTOLA, GIUSEPPE, civil engineer, Rua Duvivier 43, Rio de Janeiro, Brazil, S. A.

DE RAPPER, JOSEPH J., technical representative, General Motors S. A., Ltd., Port Elizabeth, S. A.

EYSTON, CAPT. GEORGE EDWARD THOMAS, director, John I. Thornycroft & Co., Ltd., London, England.

FEVRIER, RENE PAUL, lecturer, Pretoria Technical College, Pretoria, S. A.

KEON, HERBERT GERALD, proprietor, Eagle Garage, Sandycove Co., Dublin, Ireland.

KERR, JOHN ALEXANDER, E. G. Eager & Son, Ltd., Brisbane, Australia.

LIZIERI, STANTON ADAM, technologist, Brico (Australia) Pty., Ltd., Sydney, N. S. W., Australia.

SALTER, EDWARD GEORGE, transport superintendent, Transport Department, Travancore State, South India.

STEDMAN, GEORGE, technical school teacher, Northcote District High School, Northcote, Auckland, No. 4, New Zealand.

About SAE Members:

A discovery revealing for the first time that like compounds in chemistry could react with similar compounds instead of only with unlike, as was heretofore expected, was announced before the 98th meeting of the American Chemical Society at Boston, last month, by **DR. GEORGE CALINGAERT,** director, chemical research, Ethyl Gasoline Corp. This discovery, applicable to thousands of organic carbon compounds used in industry, "all but shakes the foundation of our general concepts of the behavior of atoms in general," Dr. Calingaert stated, adding that "when like compounds begin to react, it is time for chemists to revise their conceptions regarding the nature of the molecules in question." In the new reaction, he said, organic compounds of the same family, such as esters, are made to react at ordinary temperatures with only the aid of a catalyst which "weakens" molecules commonly thought to be very firm; freeing their atoms, and enabling the atoms to undergo "random redistribution" in new combinations.

DR. ROSS P. ANDERSON, secretary, division of refining, American Petroleum Institute, has been nominated for chairman of the Standards Council of the American Standards Association. He at present holds the office of vice-chairman.

I. I. SIKORSKY, engineering manager, Vought-Sikorsky, United Aircraft Corp., Stratford, Conn., and **WALTER B. LASHAR,** chairman of the board, American Chain & Cable Co., Bridgeport, Conn., have been named to a new State Aeronautical Development Commission appointed for Connecticut.

Early last month **GEORGE W. SCHACHT** joined Hicks Body Co., Inc., Lebanon, Ind., as time study and production engineer. Formerly he held a similar position with the Auburn Automobile Co., Connersville, Ind.

C. G. A. ROSEN has been appointed director of the automotive diesel fuel volatility projects of the Cooperative Fuel Research Committee.

W. H. SPENCER'S appointment as manager of the Wilkening Mfg. Co.'s foundry division recently has been announced. Before joining

W. H. Spencer
To Wilkening

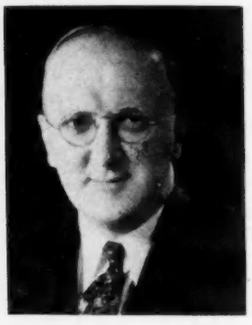
the Philadelphia company Mr. Spencer was technical director of the Sealed Power Corp., Muskegon, Mich., with which he had been affiliated since 1934. He is a graduate of Vanderbilt University, class of '26.

S. B. ROBERTSON has resigned as president of the B. F. Goodrich Co., Akron, after 20 years of active service.

A. G. MARSHALL, manager, technical applications, Shell Oil Co., Martinez, Calif., visited SAE Headquarters while in New York last month.

W. ERIC HARRIS, resident manager, Electric Auto-Lite, Ltd., Sarnia, Canada, writes, in resigning as chairman of the Canadian Section's membership committee, that the 26th Battery, R.C.A., which he commands, is being mobilized for active service, and "I have to get out from under all other duties which I had hitherto undertaken."

The title of **H. W. GRAHAM,** general metallurgist of Jones & Laughlin Steel Corp., Pittsburgh, for a number of years, has been changed



H. W. Graham
New Title

to director of metallurgy and research. He joined the company in 1914.

DALE EMMET WILKINS, who recently received his degree of Master of Science in Engineering from Purdue University, is engine tester with Wright Aeronautical Corp., Paterson, N. J. **JOHN R. SNOWBALL, JR.,** another Purdue alumnus, is doing research and tire development work with the Firestone Tire & Rubber Co., Akron, Ohio.

CHARLES H. MILLER, who was in South America when elected treasurer of the Cleveland Section, is now in Europe and may visit Australia before he returns home. A planned visit to Russia was cancelled because of unsettled international conditions. Mr. Miller is export service manager of the White Motor Co.

J. L. SJOLANDER, experimental engineer, Cleveland Wire Spring Co., spent a month in Sweden this summer.

ARTHUR A. BULL, who was president of the Handy Governor Corp. before its merger with the King-Seeley Corp., is vice-president of the latter company, in charge of the Handy Governor Division.

JOHN A. C. WARNER, secretary and general manager of the SAE, has prepared an article on the SAE Standardization Program for early publication in *Industrial Standardization,* official organ of the American Standards Association.

J. F. WINCHESTER, Standard Oil Co. of N. J., has been added to the group representing transportation on the American Petroleum Institute's public relations committee.

T. B. MOORE, president and general manager of the Detroit Ball Bearing Co., Detroit, has announced that on Aug. 16 the Detroit Ball Bearing Co. of Ohio became successor to the Ohio Ball Bearing Co. of Toledo. This firm, which specializes in anti-friction bearings and devices for industrial applications, will continue to operate in the 16 counties of northwestern Ohio.

L. MORGAN PORTER has resigned as assistant professor of machine design at New York University to become an engine designer for Pratt & Whitney Aircraft, East Hartford, Conn.

EDDIE MOLLOY, formerly assistant chief engineer, Curtiss Aeroplane Division, Curtiss-

Eddie Molloy
With Stinson

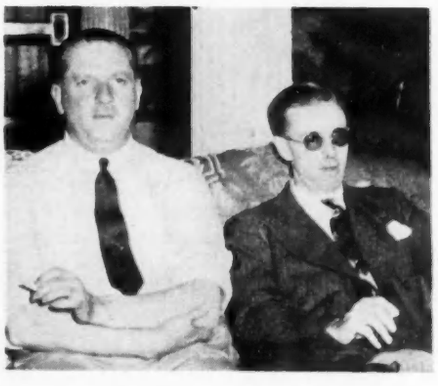
Wright Corp., Buffalo, N. Y., has been appointed project engineer of the Stinson Aircraft Division, Aviation Mfg. Corp., Wayne, Mich.

JAMES A. GRAMLING, formerly an SAE Student Branch member at the University of Detroit, is a template maker with the Douglas Aircraft Co., Santa Monica, Calif.

Since Sept. 1, **DOUGLAS F. LINSLEY** has been engineer with the Differential Wheel Corp., New York. Previously he was sales engineer for the Houde Engineering Corp., Buffalo.

CHARLES W. PHELPS, consulting engineer, recently closed his Chicago office to join the mechanical engineering staff of Purdue University with the rank of instructor. He will continue his consulting work on a part time basis.

The Railton Red Lion, which the British sportsman John Cobb piloted to new world land-speed records in late August, was designed by **REID A. RAILTON,** chief engineer, Thompson & Taylor, Ltd., Surrey, England, and was built in his company's workshops. The new record for the mile (average for north and south runs) is 368.85 mph, and for the kilo-



John Cobb **Reid Railton**

meter, 367.74 mph, subject to official confirmation. Previous records, set by Capt. G. E. T. Eyston, were 357.5 mph and 357.45 mph, respectively, for the mile and the kilometer. Mr. Cobb also set new records for the following distances: 10 miles, 10 kilometers, and 5 kilometers.

GEORGE D. LAUGHTER, who has been representing the Cimatool Co. as eastern district sales engineer with headquarters in Newark, N. J., has been transferred to the company's Dayton, Ohio, office.

L. G. RODGERS, formerly a student at the University of Tulsa, is a college trainee with the Ashland Oil & Refining Co., Ashland, Ky.

HENRY FORD is the recipient of the James Watt International Medal, it was announced at the Spring Meeting of the Institution of Mechanical Engineers held in London, June 9. Present at the ceremony was Hon. Joseph P. Kennedy, American Ambassador to England, who, on behalf of the American people, thanked the members of the Institution for their recognition of Mr. Ford's contributions to the advancement of engineering.

E. Bruce Ball, president of the Institution, stated that Mr. Ford had been nominated for this honor by the American Society of Mechanical Engineers.

Following the announcement of the award, a contemporary portrait of James Watt, by C. F. von Breda, was unveiled. The portrait, which is dated 1792, recently was acquired by the Institution.

FRED W. CEDERLEAF's appointment as factory manager of the Dodge Mfg. Co., Mishawaka, Ind., recently was announced. Before joining this firm, one of the oldest producers of industrial transmission equipment, Mr. Cederleaf was general manager of the Diesel Equipment Corp., Chicago, and was earlier manager of the machinery division of the Ex-Cell-O Corp., Detroit. As an SAE vice-president in 1933, he headed the Society's Production Activity.

WILLIAM T. SCHWENDLER, chief engineer, and **B. ALLISON GILLIES,** executive manager of Grumman Aircraft Engineering Corp., have been added to the company's board of directors.

H. HOWARD PETERS, who graduated from the University of Wisconsin in June, reports that he has a combination time keeping and job costing job with the Luitink Mfg. Co., Milwaukee.

GLENN L. MARTIN, president, Glenn L. Martin Co., Baltimore, who taught himself to fly in the early days of aviation, but who has not piloted a ship for the past 15 years, is going to school to learn to fly modern airplanes.

ALBERT S. MENASCO, who designed and built his first aircraft engine in 1926, and presided over the Menasco Mfg. Co. for the next 12 years, has retired from aviation to become a car dealer in Culver City, Calif., a suburb of Los Angeles.

ROBERT G. HALL recently was transferred by the Fleet Sales Division of General Motors Sales Corp., from St. Louis, Mo., where he was regional manager, to Tulsa, Okla., where he is district manager.

JOHN A. LAWLER, who has been development engineer and partner of the L-F Engineering Co., Detroit, is designing engineer, aircraft motors, with the Lycoming Motors Division of Aviation Mfg. Corp., Williamsport, Pa.

VICTOR J. STEFFECK, formerly district sales manager of the Four Wheel Drive Auto Co. in Los Angeles, is now representing the company in the Territory of Hawaii. His headquarters are in Honolulu.

The Delta Tau Delta fraternity's new president is **PAUL G. HOFFMAN,** president of Studebaker.

JOHN L. PARKS, who was shop superintendent for Horton Motor Lines, Inc., Baltimore, Md., has joined the Brown Equipment & Mfg. Co., Charlotte, N. C., as plant superintendent.

J. A. PACKARD, formerly engineer, automotive division, Armour & Co., Chicago, is with the Available Truck Co., of the same city.

An English translation of Dr. Rudolf Diesel's biography by his son, Eugen Diesel, has been completed by **A. R. CODE,** petroleum technologist and chartered mechanical and automotive engineer of Melbourne, Australia. Mr. Code is making arrangements for its publication in book form.

JOHN S. MALONEY, formerly consulting engineer and designer of air conditioning and fuel dispensing equipment for Gilbert & Parker Mfg. Co., West Springfield, Mass., has joined the Chandler-Evans Corp., Meriden, Conn., as research and project engineer.

F. A. SELJE has resigned as director of interior art and body design at Chrysler Corp., Detroit, and is establishing an industrial design practice on the Pacific Coast. He is now residing in Beverley Hills, Calif.

Word comes from England that **CAPT. J. P. BLACK,** managing director of the Standard Motor Co., Ltd., has been gazetted Hon. Colonel of the 22nd Battalion, Light Aircraft Regiment, Royal Artillery (T.A.). Captain Black served during the war of 1914-1918 with the Royal Tank Corps, and ever since has taken a great interest in the welfare of ex-service men.

Capt. J. P. Black
Honored

ARNOLD H. EGLY, formerly a student at the Boeing School of Aeronautics, is with American Airlines, Inc., as meteorologist. He is stationed at Ft. Worth, Texas.

Upon completing his studies at the University of Oklahoma, **RICHARD MYERS** joined the Magnolia Petroleum Co., Dallas, Texas, as petroleum engineer.

EDWARD W. McCLELLAND, who was with the Shakeproof Lock Washer Co. for 11 years, has joined the Thompson Bremer Co., in Detroit.

No. California Chairman

U. A. Patchett, 1939-1940 chairman of the Northern California Section, whose picture was not available in time for publication in September with those of other SAE Section Chairmen.

ALONZO P. MERCIER has joined Hamilton Standard Propellers, East Hartford, Conn., as junior designer. He formerly was a student at Pratt Institute, Brooklyn, N. Y.

CHARLES A. CRIQUI, SR., founder and president of Sterling Engine Co. for 33 years, has announced his resignation as president of the company. He will serve as chairman of the board of directors and on the executive committee.

FRANK ORVILLE CLEMENTS retired from his position as technical director, General Motors Corp., Research Laboratories, on Oct. 1. He had been affiliated with the company for 19 years.

M. A. MIERAS, formerly sales and experimental engineer with United Specialties Co., United Air Cleaner Division, Detroit, recently joined the Industrial Wire Cloth Products Corp., Wayne, Mich.

C. G. KRIEGER, experimental engineer, Ethyl Gasoline Corp., Detroit, is scheduled to present a paper on "Fuels and Lubricants for Farm Tractors," at the Oct. 5 meeting of the Manufacturing Division of the Western Petroleum Refiners Association, Wichita, Kan.

Dr. Adolf K. Rohrbach

Dr. Adolf K. Rohrbach, German aircraft designer of international reputation, died July 9 following a heart attack while on his summer vacation at Bad Kampen. He was 51 years of age and had more than 25 years of experience in the development of airplanes and the building of flying boats. His early experience was with Luftschiff Zeppelin as designer in the flying boat department of Dornier during 1914-1916. For the next five years he was designer and later chief designer at Zeppelin Werke, Berlin, where he did theoretical and practical work in connection with the design and construction of huge bombardment biplanes, big twin-float seaplanes, and the 4-engined all-metal Staaken monoplane, which was later ordered destroyed by the Inter-Allied Aeronautical Commission in compliance with the Versailles Treaty.

After leaving Zeppelin and practicing as consulting engineer for a little more than a year Dr. Rohrbach became general manager and chief engineer of Rohrbach Metall-Flugzeugbau, retaining this position until he became a director of "Weser" Flugzeugbau Gesellschaft m.b.h., Berlin, upon its formation in 1934. He became a Foreign Member of the Society in 1930.

Olin B. Clark

Olin B. Clark, service engineer, Airsupply Co., Los Angeles, who joined the Society early this year, died late in August. He had been affiliated with his company since 1938 and earlier had held technical positions with the Northrup Corp., the Northrup Aircraft Corp., and the Douglas Aircraft Co. He was born in Oregon in 1899.

Jean Bugatti

Jean Bugatti, general manager of Bugatti, Molsheim, France, was killed in an accident while testing a racing car near Strasbourg on Aug. 12. At high speed he swerved to avoid a bicyclist, crashed, and was killed instantly.

Son of the famous French car manufacturer, Ettore Bugatti, Mr. Bugatti became general manager of his father's company after gaining both technical and practical experience in different departments of the factory. He was an excellent driver and a racing enthusiast.

Mr. Bugatti's application for SAE membership was received only a few day's before his death and his name was included in the Applications Received section of the September Journal.

News of the Society

SAE Speeds Aircraft Standards Projects

Preliminary study for setting up definite standards on aircraft screw threads, progress in drafting a new standard for aircraft-engine testing forms, and the gathering of data upon which to base an SAE Standard series of involute splines for driving equipment on aircraft engines, have been reported by the SAE Standards Department.

Both the Aircraft and Aircraft-Engine Divisions of the Standards Committee are cooperating with the Screw-Threads Division in the ground work for developing the standard for aircraft screw threads in the inch and metric systems. Representatives of the Army and Navy are also participating in this work.

Russell T. Howe, Wright Aeronautical Corp., is chairman of the group that is drafting the new standard for aircraft-engine testing forms which is being carried on in conjunction with the general review and revision of the present standard gasoline and diesel-engine forms. Work has progressed to the point that a meeting is scheduled early this month to act on drafts of the proposed aircraft-engine forms.

Data on which to base a new standard series for involute splines for driving equipment on aircraft engines is being gathered by Gustaf Carvelli, Wright Aeronautical Corp. It is probable that the new series will eventually replace the present standard spline drives for individual equipment on aircraft engines.

All-Day Railroad Meeting Includes Inspection Trip

● Chicago

A Section meeting of more than local interest is scheduled for Chicago on Oct. 6. Headliners among railroad engineers will get top billing at this all-day event to be held at the Blackstone Hotel. In planning the program, which will draw engineers and suppliers of the many railroads terminating in Chicago, the Section had the cooperation of the Society's Truck, Bus & Railcar Activity.

Gray Dinner Speaker

Carl R. Gray, Jr., executive vice-president, Chicago, St. Paul, Minneapolis & Omaha Railway Co., principal speaker at the dinner, will take as his subject "Modern Streamlined Railroading." SAE Past-President C. W. Spicer, vice-president, Spicer Mfg. Corp., will be the honorary guest. They will be introduced by Toastmaster Ernest Kuehn, mechanical manager, Electro-Motive Corp.

Technical Session

As technical chairman of the session at 9:30 a.m., A. R. Walker, electrical engineer, equipment, Illinois Central, will call on speakers Peter Parke, chief engineer, Pullman-Standard Car & Mfg. Co., and E. J. W. Ragsdale, chief engineer, railcar division, E. G. Budd Mfg. Co. Mr. Parke will talk on "Railway Passenger Cars," and Mr. Ragsdale's subject will be "The Inside Story of a Weld."

Inspection Trip Scheduled

At one o'clock the meeting will move to the California Yards of the Chicago & Northwestern Railway Co., where the group will inspect that company's new "400" train as well as the Union Pacific-Northwestern trains the "City of Los Angeles" and the "City of Denver."

SAE *Coming* EVENTS

Oct. 5-7 — **National Aircraft Production Meeting**
Hotel Biltmore – Los Angeles

•

Oct. 16 — **Annual Dinner**
Hotel Pennsylvania – New York

•

Oct. 26-27 — **National Transportation & Maintenance Meeting**
Coronado Hotel – St. Louis, Mo.

•

Nov. 2-3 — **National Fuels & Lubricants Meeting**
Mayo Hotel – Tulsa, Okla.

•

Jan. 15-19 — **Annual Meeting *and Engineering Display***
Book-Cadillac Hotel – Detroit

Baltimore – Oct. 5

Engineers Club; dinner 6:30 p.m. Silhouette Seeing with Motor Car Headlights – Lewis B. Moore, General Electric Co.

Chicago – Oct. 6

Blackstone Hotel; morning and afternoon sessions, with dinner at 6:45 p.m. (*For program details see Chicago Section Story on this page.*)

Cleveland – Oct. 9

The New Sealed-Beam Headlight – Val J. Roper, engineer, General Electric Co.

Dayton – No Meeting

Detroit – Oct. 2 and 23

Oct. 2 – Closed meeting – for SAE members only. Hotel Statler; dinner 6:30 p.m. The Dynamic Fatigue Life of Rubber—Dr. S. M. Cadwell, director of development, U. S. Rubber Co.

Oct. 23 – Hotel Statler; meeting 8:00 p.m. A Critical Analysis of Brake Lining Test Methods – T. R. Stenberg, chief engineer, Marshall Asbestos Corp., and C. N. Menz.

Indiana – Oct. 12

Antlers Hotel, Indianapolis; dinner 6:30 p.m. Aviation Meeting.

Kansas City – Oct. 30

Continental Hotel; dinner 6:30 p.m. Subject – Transportation.

Metropolitan – Oct. 19

Hotel Governor Clinton, New York City. Preview of the 1940 Cars – Harold Blanchard, technical editor, *MoTor*. Closed meeting – for SAE members only.

Sealed-Beam Headlighting – R. N. Falge, chief engineer, Guide Lamp Division, General Motors Corp., and D. D. Blanchard, secretary, Engineering Relations Committee, SAE.

Milwaukee – Oct. 27

University of Wisconsin, Madison, Wis.; dinner 6:30 p.m. in Tripp Commons Hall. Hydraulic Brazing – H. M. Webber, General Electric Co.

(*Concluded on next page*)

New England – Oct. 24

Engineers Club, Boston, Mass.; dinner 6:30 p.m. The 1940 Models – Dean A. Fales, associate professor of automotive engineering, Massachusetts Institute of Technology.

Northern California – Oct. 13

Oregon – Oct. 13

Swan Island Airport, Portland; 7:30 p.m. Meeting sponsored by United Air Lines. Subject – Radio Track.

Philadelphia – Oct. 11

The Penn A. C.; dinner 6:30 p.m. The 1940 Passenger Cars from the Consumer's Viewpoint – F. J. Schlink, technical director, Consumers' Research, Inc.

Pittsburgh – Oct. 17

Roosevelt Hotel; dinner 6:30 p.m. New Engine Developments – Max M. Roensch, experimental engineer, Chrysler Corp.

St. Louis – Oct. 26 and 27

Coronado Hotel. Participation in the National Transportation and Maintenance Meeting of the Society. (*For program details see page 14.*)

Southern California – Oct. 5-7

Hotel Biltmore, Los Angeles. Participation in the National Aircraft Production Meeting of the Society.

Southern New England – Oct. 10 and Nov. 1

Oct. 10 – Bond Hotel, Hartford; dinner 6:30 p.m. Tocco Hardening – W. E. Benninghoff, division manager, Ohio Crankshaft Co.

Nov. 1 – Trends in Design of 1940 Cars – T. A. Bissell, technical editor, SAE Journal.

Syracuse – No Meeting

Washington – Oct. 9

Cosmos Club, Washington, D. C.; dinner 6:30 p.m. Aircraft Propellers – Fred E. Weick, chief engineer, Engineering & Research Corp.

Device Indicates Miles Per Gallon

● Denver Club

Many who are supposed to know a great deal about car performance do not fully realize how gasoline consumption is influenced by many factors which do not remain constant, even on a short run, Edward E. Harrison, service superintendent, Harrison Motors, Inc., Denver, told members of the SAE Club of that city at their last meeting.

Temperature of the motor, road surfaces, grades, velocity and direction of the wind, speed, load, carburetor adjustment, timing of the motor, type of gasoline used, inflation of tires, condition of spark plugs and pistons, are among the factors that help decide the car's performance, he said, adding that common methods of computing gasoline consumption give only an average consumption over a given period.

He then described in detail an instrument which continuously indicates on an electrical meter the number of miles per gallon of gasoline consumed in a very similar manner that the speedometer continuously indicates the speed of a car in miles per hour.

This device, he explained, measures electrically, both the speed in miles per hour and the rate of flow of gasoline in gallons per hour, and combines these two electrical values in such a way that the speed component is divided by the rate of flow.

How the instrument works and how it may be used to indicate the torque per rate of consumption of fuel or horsepower per gallon per hour, was illustrated by Mr. Harrison, who added that the device is also applicable to many forms of industrial work.

After the meeting the gasoline-mileage indicator was demonstrated to the 40 members present who were taken on a trip to the foothills in a 45-passenger bus equipped with this device.

Good Turnout at Annual Golf Event

● Milwaukee

The annual golf meeting of the Milwaukee Section was held at the Merrill Hills Country Club, Waukesha, Sept. 8. First prize went to B. F. Flemming, and the traveling cup, which reappears each year for high score, was handed to Howard Steele.

The turnout was good, 65 playing golf in the afternoon and 86 attending the dinner.

About Authors

(*Concluded from page 7*)

tive in 1918 when he was in the 332nd Battalion Tank Corps, United States Army. Automotive engineer with the National Bureau of Standards since 1927, Mr. Brooks earlier had been with the Studebaker Corp. and The Texas Co., and in other capacities at the Bureau of Standards. Ohio State University granted him his B.Ch.E., M.Sc., and Ch.E. degrees.

● Gordon Brown ***(M '21), at the age of 21 was captain of the 89th United States Infantry which he entered when the World War halted his scientific course at Rutgers University. When mustered out he im-***

mediately joined the Condensite Co., one of the forerunners of the Bakelite Corp., which had employed him during school vacations as early as 1911. Bakelite's sales manager since 1933, he has had a wide variety of engineering consultation experience in connection with the application of different types of plastic materials.

● **Mrs. Robetta B. Cleaton,** *one of the few women to contribute material published in the SAE Journal, has been engaged in statistical research connected with motor fuel problems, and in research on the impurities present in normal heptane and iso-octane, the primary reference standards of knock testing, since joining the National Bureau of Standards in 1936. She was born in Scotland and educated in England and America. Before joining the Bureau of Standards she did statistical work for the United States Bureau of the Census.*

● *It is hard to catch* **Paul S. Lane** *(M '36) on questions concerning production and control of ferrous and nonferrous castings, especially piston-ring castings. Before becoming metallurgical research engineer in charge of the research and engine laboratories of the American Hammered Piston Ring Division of Koppers Co. in 1936, he was, for five years, American Hammered's chief metallurgist, and earlier had been metallurgist and assistant foundry superintendent of the Bartlett Hayward Co. After completing his courses at Brooklyn Polytechnic Institute he rounded out his technical education by attending night classes sponsored by Johns Hopkins University.*

● *During the college years of 1931-1932 and 1932-1933* **Prof. Wilhelm Spannhake** *could be found teaching hydraulics to MIT students, as visiting professor from Badische Technische Hochschule, Germany, where he has been professor of hydraulic engineering since 1921. After receiving his degree of diplomingenieur from the Technische Hochschule, Munich, in 1904, he had been designing and chief engineer at the Vulcan-Werke, Hamburg and Stetten, and chief engineer of the turbine works of Fritz-Neumeyer A.G. (combined with Briegleb, Hansen & Co., Gotha), before accepting his professorship at Karlsruhe.*

SAE Papers in Digest

HERE are digests of papers presented at various meetings of the Society.

Some of these papers will be printed in full in the SAE JOURNAL.

Mimeographed copies of *all papers received* will be available, until current supplies are exhausted, at a cost of 25 cents per copy to members; and at 50 cents per copy to non-members, plus 2% sales tax on those delivered in New York City. Orders for mimeographed copies must be accompanied by remittance and should be addressed to Sessions Secretary, Society of Automotive Engineers, 29 West 39th St., New York.

National Transportation Engineering Meeting, New York Nov. 14-16, 1938

Why Not 125 BMEP in an L-Head Truck Engine?—*F. S. Baster, The White Motor Co.* (Paper published, pages 72-76, Transactions Section, February 1939 issue.)

Tire Sizes—Not More but Better—*M. C. Horine, Mack Mfg. Corp.*

INTERVALS between tire sizes for six-tire trucks vary from 1050 to 6600 lb in capacity, and these intervals are too great, at least above the 7.50 size, Mr. Horine contends, comparing a range of tires from 5.50-20 to 13.50-24.

For the cause for this condition he goes back to the establishment of the present system of tire sizing, claiming that it was done on an arbitrary basis rather than starting with a series of capacities that would be found most useful from a standpoint of the weights to be sustained. Study of load, body, and chassis weights, of legislative axle weight restrictions and registration fees then could have established a scale of practicable gross vehicle weights for which tire sizes could be devised, Mr. Horine points out.

To remedy the situation he suggests five additional sizes within the range discussed. It is explained that, if 22-in. rims were abandoned, eight present sizes would be eliminated, seven new sizes avoided, and the total result would be fewer sizes than at present. He also reminds that elimination of high-pressure tires before long will decrease the total number of sizes to fourteen.

It is further recommended that tires be desig-

nated by rim size and capacity, for example, 22-5000 instead of the present 10.50-22. Charts and tables are included to confirm the author's contentions.

Instrumentation for Maintenance and Test Procedure of Electrical Equipment – *W. H. Yenni, Joseph Weidenhoff, Inc., and W. A. Roberts, Rappuhn Corp.*

THE program for instrumentation procedure for maintenance resolves itself into three divisions:

1. The adoption of certain standard measuring instruments for determining the condition of various factors in the engine.

2. Standardization of a method or methods of procedure in the use of such instruments.

3. A program to educate mechanics in the use of both the instruments and the method of procedure, which program must include a distinct effort to convince the mechanic that it is to his advantage not only to learn to use these instruments and methods but also to acquire a more complete understanding of the engines on which he depends for at least a portion of his livelihood. By means of instrumentation the performance of the various parts of the engine can be measured and, by comparing these measurements with known standards, we can tell if they are capable of continuing to operate normally.

The majority of this paper consists in a detailed discussion of the meters and gages that constitute the measuring instruments used in this method of "trouble-shooting" or motor analysis. So-called "motor analyzers" or "motor tune-up machines" are regarded largely as a means of furnishing the mechanic the various instruments required in a compact and usable manner.

New Kinks in Live Truck Operations – *Henry Jennings, "Commercial Car Journal."*

INGENIOUS devices and shop kinks designed and built in the shops of 30 odd motor-vehicle fleet operators to solve unusual maintenance problems, to adapt to strange shop layouts and conditions, or to eliminate difficulties caused by vehicles operating under peculiar conditions, are reported in this paper.

Although there is no evidence at hand that fleet operators as a class wish to desert their amateur standing as designers, they frequently have been able to improve their lot by means of a little "rough-and-tumble" design in such cases, the author states, particularly in cases where the problem is so special that no commercial products are available to solve the problem.

Drawings are presented to illustrate the devices described, among which are a skid-chain bench, a parts-cleaning tank, a paint-saving kink, a fuel-line emergency, a portable jack and wheel dolly, handy miniature jack, Ford spring jack, oil-can drain pan, method for freeing frozen shackles, method for removing blind bushings, rear-axle puller, magnetic pickup tool, aluminum cylinder-head lifter, and surge tank for conserving antifreeze.

Diesel-Electric Bus Drives – *G. W. Wilson, General Electric Co.*

DURING the past 12 yr approximately 3000 electric-drive buses have been placed in service in this Country, 300 of which are used with diesel engines in large city buses and were placed in service during the last two years. This renewed interest in the diesel-electric bus has been brought about by the successful operation of the automotive diesel with its apparent fuel economy and the application of large buses to heavy city service.

Anticipating this demand, the General Electric Co. recently completed the development of new electric drive equipment incorporating the experience gained through the manufacture of some 2500 gasoline-electric drives. Although somewhat more expensive and heavier than gear-box drives, the electric drive has been made 35% lighter, 25% less expensive, and 3 to 8% more efficient than its predecessor.

The author contends that experience has proved the necessity for having some form of flexible drive between the diesel engine and the driving wheels of a bus to reduce vibration and noise in the passenger compartment and to damp the torque pulsations of the driving mechanism. The diesel-electric drive, he claims, provides fully automatic, infinitely variable ratio transmission of power and permits complete mechanical isolation of the power unit from the passenger compartment.

Problem No. 1 in the design, application, and operation of these diesel-electrics is named as the control of excessive heat. Illustrations show details, typical applications, wiring diagrams, and performance characteristics of the equipment.

Trends in Commercial-Vehicle Spring Suspension – *N. E. Hendrickson, The Mather Spring Co.* (Paper published, pages 104-108, Transactions Section, March 1939 issue.)

Section Papers

Detroit – Oct. 17, 1938

Heating and Air-Conditioning of Automobiles – *F. J. Linsenmeyer, University of Detroit.*

AIR-CONDITIONING of the motor vehicle is entirely possible, Mr. Linsenmeyer concludes, although the equipment necessary is rather expensive at present and in need of further research and development. This condition, he believes, is similar to that in the air-conditioning of residences and buildings some time before its fairly recent popularity. Undoubtedly air conditioning will spread to the common carrier, he believes, but it will take much popular advertising to sell it to the passenger-car owners.

This paper describes some of the experiences that have been accumulated as a result of experiments with various methods of controlled heating and cooling of automobiles.

As his definition for air-conditioning, the author uses that of the American Society of Heating and Ventilating Engineers, that is, it must include: 1. controlled heating and cooling; 2. humidification and dehumidification; 3. ventilation; 4. distribution of air; and 5. purification of air.

Detroit weather conditions are used as the basis of the author's calculations because they represent the two extremes of weather conditions, heat in summer and cold in winter. Under separate headings in the body of his paper he discusses heating by hot air and hot water, cooling by various means, air cleaning, humidification, and ventilation.

St. Louis – Oct. 26

Bus Maintenance as Related to Mass Transportation in an Urban Center – *A. Ebinger, St. Louis Public Service Co.*

THIS paper deals with the problems encountered in maintaining a modern fleet of buses used in the transportation system of St. Louis.

A system of unit maintenance is the backbone of the preventive maintenance plan. With this system the duty of the Automotive Division is to obtain the maximum useful life from each unit, and to do this while experiencing a minimum number of actual failures.

To accomplish this objective, each unit is first studied and examined in order to estimate accurately the mileage expected of it. When the life expectancy of the unit has been determined finally, all units of the same type are expected to operate economically and satisfactorily during this mileage period. With a judicious timing of the removal of these units, it is possible to insure an even flow of work into the Automotive Shop. The ability to plan the shop work several weeks, and even months, ahead so that the shop output can be budgeted is a most important feature of this system. The following figures will give some idea of the number of units removed during 1937: clutch assembly, 602; clutch discs, 715; air compressors, 234; carburetors, 891; fuel pumps, 771, and so on.

The engines are handled in a slightly different manner; the mileage figure is a definite factor, but it is modified by the record of engine performance and behavior. The deciding factor in the latter category is the amount of oil that the engine is consuming and likewise its load ability. Usually at 140,000 miles the engine is scheduled for a general overhaul. Descriptions are given of the various operations of the overhaul including cleaning, testing, inspection, reassembling, and running-in.

In conclusion the author stresses the importance of rigid adherence to a fixed procedure, fits, and tolerances.

(*Continued on next page*)

(*Continued from previous page*)

Tulsa Group – Nov. 4

Machine Shop Practice in Reconditioning Automotive Equipment – *Joe Rhodes, Standard Parts Co.*

THE automotive machine shop not only renders a valuable service in the fitting of new parts, but fills a real economic need in being able to reconstruct various automotive units and parts that otherwise would be scrapped. This salvaging of parts brings to the automotive-vehicle operators an immense saving in operating costs.

In this paper the term "automotive machine shop" applies only to those machine shops adequately equipped and manned not only by good machinists but by those who also have experience with and knowledge of the construction of various automotive units. The equipment must be more or less universally designed to recondition or re-machine automotive parts of varying types and design. In addition, there must be tools and certain fixtures designed for particular makes and designs in order to produce a satisfactory job at minimum cost.

Some of the typical mechanical services rendered by the automotive machine shop covered in this paper are engine reconditioning – cylinder reconditioning, refacing valve seats, fitting of valves, valve guides and pistons to the proper clearance and alignment, and regrinding of crankshaft; resurfacing of clutch pressure plates; installation of transmission bearings; straightening of rear-axle housing; truing of brake drums; and so on. Equipment described includes the cleaning tank, cylinder-reconditioning equipment; piston grinder; crankshaft grinder; align boring fixture; valve-seat reconditioning equipment; clutch rebuilding equipment; brake rebuilding equipment; and miscellaneous tools.

Pittsburgh – Nov. 15 and Milwaukee – Dec. 9

Engine Lubrication under Cold Weather Conditions – *Dr. M. J. Zucrow, Spitzglass & Zucrow.*

ALTHOUGH this paper is concerned principally with the aspects of lubrication that are related to cold-weather operation, some space is devoted to the general problem in order to offer a proper perspective.

The changes occurring in a motor oil are considered as being due to inherent impurities and foreign impurities. Inherent impurities are defined as those materials formed by chemical reaction and polymerization resulting from the interaction of the oil with other chemicals present in the engine. Tables are included that show the effects of metals on oil oxidation, analyses of new and used oils, and an analysis of an uncontrolled fleet.

Deposition of water in the crankcase is named as causing more difficulty than any other effect in cold-weather operation. Data are given that show that corrosion-resistant cylinder liners aid in combating corrosive wear. Causes and effects of crankcase dilution on engine wear and viscosity are reviewed, and the average results for a fleet of ten trucks in this regard are presented. Under other headings, starting difficulties, engine warm-up, fuel consumption for a milk-truck fleet, the effect of oil viscosity on fuel economy, draining periods, selection of lubricants, and comparison of oils on the basis of SAE Number, are discussed.

Metropolitan – Dec. 1

Basic Problems in the Design of High-Output Aircraft Engines – *T. C. Tsien, Massachusetts Institute of Technology.*

HERE is presented an analysis of important technical problems in the design of high-output aircraft engines. Different methods of boosting the output are considered fundamentally. The method of supercharging is revealed to be the most promising one.

Design limitations to high outputs are named as stress, heat dissipation, piston speed and detonation. The removal of each limit would require, beside chemical and metallurgical improvements, the use of spark control, valve overlap, and injection of anti-detonating or artificially cooling liquid. The utilization of energy from exhaust gas is advised strongly. A numerical example is shown for a design of 3000-hp engine, and possible arrangements of cylinders are compared. Necessary alterations in design are recommended to acquire high specific output.

Chicago – Dec. 6

Aircraft Fuels – *T. B. Rendel, Shell Oil Co., Inc.*

MR. RENDEL lists in the order of their importance the desirable qualities of an aviation gasoline as follows: high antiknock value, high heat of combustion, high volatility, high immiscibility with water, low vapor pressure, stability in storage, low freezing point, low sulfur content, cleanliness, and pleasant odor.

Stating that the majority of the increased performance of present-day output aircraft engines is due largely to improvements in the anti-detonating tendency of the fuel, he emphasizes that this tendency is by far the most important factor of the aviation fuel – the one on which the most work has been lavished. Pointing out present limitations to the octane-number method of classification of fuels, he mentions that the laboratory rating of a fuel often has been found to be a poor guide to its full-scale performance, and that information regarding the full-scale behavior of fuels of 83 to 100 octane number or higher is far from complete and inadequate for all types of fuels and antiknock compounds.

The four main methods of measuring the antiknock value of a fuel – ASTM, CFR Research, British Air Ministry, and U. S. Army Air Corps – are compared. To correct the poor correlation for fuels over 87 octane number, he announces that the Aviation Fuels Division of the CFR Committee is working actively on a project to develop a new knock-testing method which it hopes will predict their full-scale behavior somewhat more satisfactorily than either the present ASTM or Army methods.

Northwest – Dec. 9

A New Emphasis in Industrial Management – *N. H. Aiken, State College of Washington.*

AFTER conceding that the topic of his paper is new only in the sense of the increasing relative importance of labor as a factor in production, Prof. Aiken points out that the assessment of strictly human values in industry is new relative to other emphases of management. This trend, he suggests, may be evidence of a new science that is being applied to industry called "humanics." This term is defined as "that science or branch of applied psychology which treats of the action and reaction of the man on the job to the techniques and procedures of management."

He believes that the very genesis of the problem, its growth, and its evolution arise out of the characteristics of human beings on the one side, and the characteristics of modern industry on the other side. He shows that the characteristics of industry many times are at variance with the characteristics of persons, and the problem of humanics is to mitigate this conflict. Is it possible, he asks, for management to apply the same open-mindedness, frankness, and scientific procedures in working with human problems as are applied to mechanical problems? Of the three ways suggested for dealing with conflict – domination, compromise, and integration – Prof. Aiken recommends integration for best results. Examples are given of the successful operation of this principle.

Baltimore – Jan. 5, 1939

Tests on Various Lubricants in a Fleet of Refinery Delivery Trucks – *F. C. Burk, Atlantic Refining Co.*

TO assist the operator in selecting the kind of oil best suited for his purpose, the results of various service tests and the methods used in conducting them as carried out by the Automotive Laboratory are described in this paper. The author qualifies that these tests are merely descriptive of the work done on his company's trucks and may not apply to all types of motor vehicles.

Described separately are tests to evaluate the qualities of various types of motor oils embracing several viscosity ranges and several basic methods of refining started in 1934; tests to determine the effectiveness of various types of filters started in 1935; and a third project started in 1936 to determine the relative merits of various oil-change periods.

The results of these tests indicate:

1. Naphthenic-type oils are more undesirable than oils of paraffinic type.
2. Crankcase oil-change periods on a semi-annual basis are more undesirable than those on a 1000-mile basis.
3. Fuel oil delivery service is more severe than gasoline delivery service.
4. Heavier oils, higher SAE numbers, cause more cylinder wear, but reduce oil consumption.
5. Paraffinic-type oils are comparable with straight Pennsylvania oils.
6. The cost of changing the oil at 1000-mile intervals is greater than at 3000-mile intervals, but a saving in engine wear favors the 1000-mile oil-change period.
7. Oil-change periods of 5000 miles are too high.
8. Oil filters, when used according to the manufacturer's recommendations, do not maintain the crankcase oil in a better condition than if the filters are not used. This statement does not mean that the principle of using an oil filter is basically wrong, but that the maintenance of the filter element as recommended may be too infrequent.

Baltimore – Feb. 2

Piston Ring Performance and Its Relation to Lubrication – *A. L. Beall, Wright Aeronautical Corp.*

MR. BEALL points out what is believed to be the importance of shape, material, and surface finish in piston rings. In its usefulness as a seal and a pump encouraging flow in the right direction, the correct shape and a suitable surface finish of a piston ring of good material are deemed essential.

Employing cast iron as the most acceptable material for piston rings, it is the author's experience that minor details in shape are important to a satisfactory run-in; that good surface finishes free from the defects produced by so-called "cold working" are essential; and that inadequacies in the preceding two items cannot be overcome effectively by the use of a special lubricating oil.

The need for competent quantitative engine tests of piston-ring designs and materials, particularly the latter, is emphasized strongly. Although conceding that supplementary test methods have a limited value, Mr. Beall contends that the measure of piston-ring usefulness must be determined by engine test.

It is believed that the future trend in the development of piston rings lies with the careful fabrication of the present rather simple shapes and that improvements will come with the materials employed. He concludes that the useful life of the most skilfully fabricated ring depends in considerable measure on its maintenance of the prescribed shape and surface finish, and improved materials can do much to maintain, for a longer period of useful life, the desired shape and surface finish.